Crop successions of resistant and susceptible eggplants strongly impact the genetic structure of a natural population of *Ralstonia solanacearum* phylotype I : A field-based experimental evolution assay using MLVA genotyping.

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WHY DID WE DO THIS?

- The use of **plant resistance** is one of the best strategies to control plant diseases.
- However, it is critical to study the genetic of pathogen evolution for predicting plant resistance durability in order to avoid its fast breakdown.
- *R. solanacearum* is responsible of bacterial wilt (BW), the **second most plant pathogenic bacterium worldwide**.
- *R. solanacearum* phylotype I has a high **evolutionary potential** (*sensu* Mc Donald and Linde), a wide range of host species, is able to survive at cold temperatures and gathers strains with highly different virulence profiles on Solanaceae. Therefore *R. solanacearum* phylotype I is an **excellent model for evolutionary dynamics studies**.
- We set up a **three-year experimental evolution trial** to compare the influence of two eggplant cultivars on the evolutionary potential of a natural population of *R. solanacearum* phylotype I.

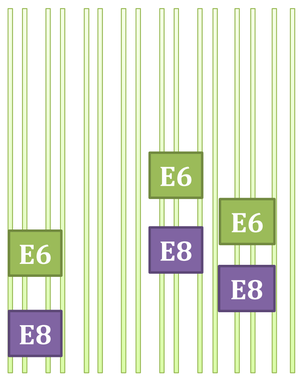
FIELD-BASED EXPERIMENTAL EVOLUTION ASSAY

2 cultivars

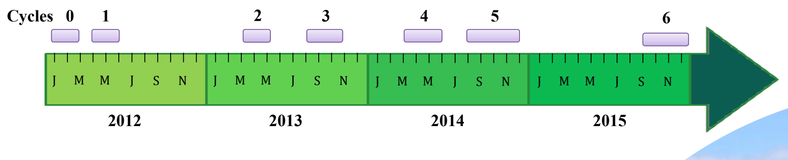
Susceptible eggplant : **E8**

Resistant eggplant : **E6**

3 microplots (MP) per cultivar (56 plants/microplot)



5 crop successions over 3 years



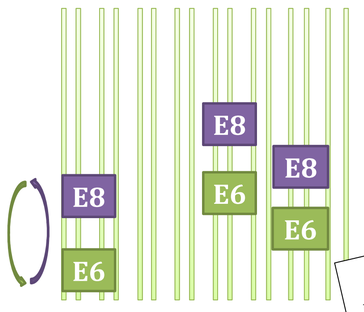
① – RESISTANT EGGPLANT E6 REMAINS RESISTANT OVER CROP SUCCESSIONS

- **No bacterial wilting** on **E6**
- Cycle 1 : **latent infection** in **E6** stems (8% of plants)
- Cycles 2 to 5 : **no detection** of *R. solanacearum* in **E6**

} **Strong effect of E6 on *R. solanacearum* populations**

HOW STRONG?

1 – Switch of microplot



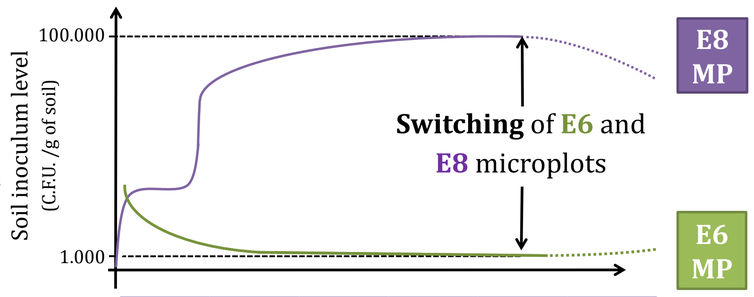
2 – E6 instead of **E8** in soil with **strong inoculum**

ENOUGH FOR E6 TO WILT? ➔ 156 **E6** implanted : **no plant wilted**

3 – E8 instead of **E6** in soil with **weak inoculum**

ENOUGH FOR E8 TO WILT? ➔ Only 8% of **E8** plants wilted

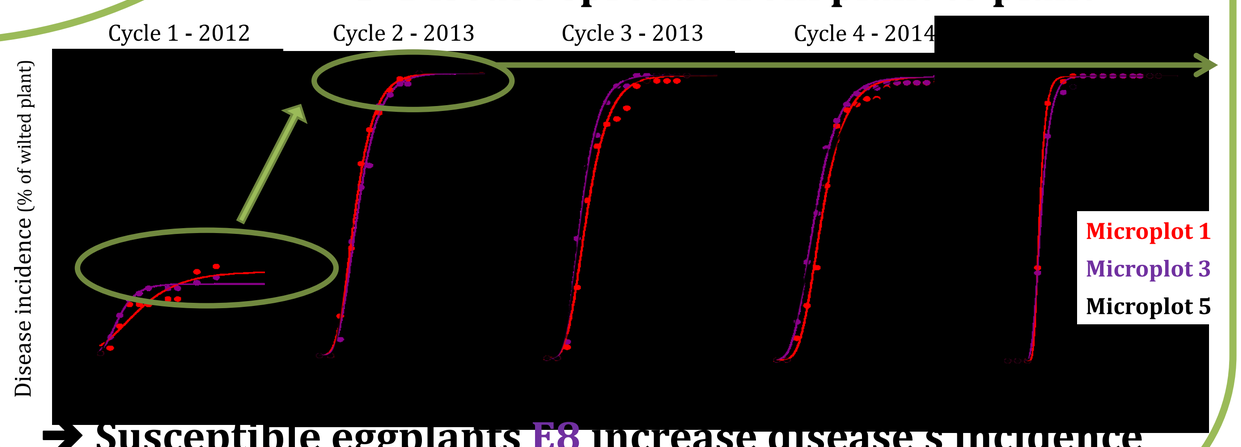
POSSIBLE EVOLUTION OF SOIL INOCULUM LEVEL



➔ **Resistant eggplants E6 reduce the population of *R. solanacearum***

② – E8 INDUCES A STRONG INCREASE IN DISEASE INCIDENCE AND SEVERITY

➔ **Disease spreads from plant to plant**



➔ **Susceptible eggplants E8 increase disease's incidence and severity**

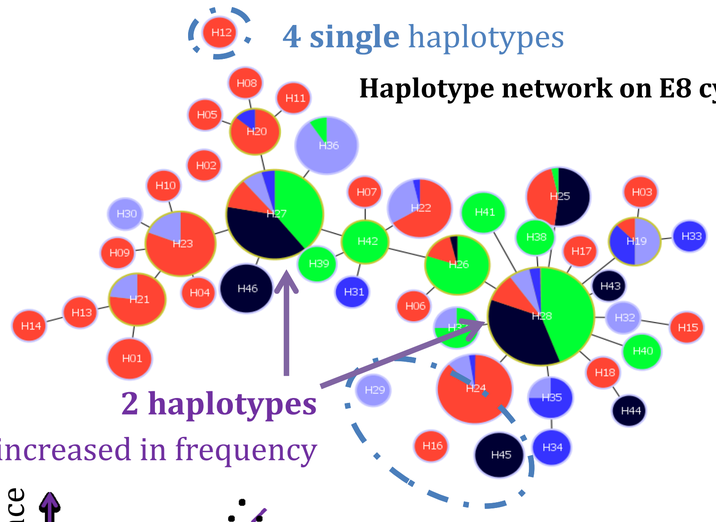
③ – SUSCEPTIBLE EGGPLANT E8 STRONGLY IMPACT BACTERIAL POPULATION GENETICS

	G/N	H.u.b
Cycle 1 – Susceptible tomato	0,088	0,318
Cycle 2 – Susceptible **(E8)** eggplant	0,045	0,236
Cycle 2 – Resistant **(E6)** eggplant	0,086	0,257
Cycle 2 – Resistant **(E6)** eggplant	0,016	0,173
Cycle 4 – Susceptible **(E8)** eggplant	0,013	0,192

- **Decrease of genetic diversity** across susceptible eggplant cycles

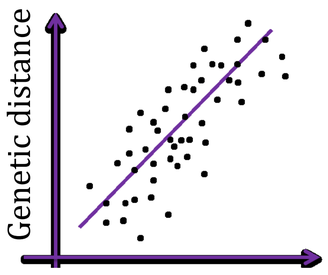
4 single haplotypes

Haplotype network on E8 cycle



1 major **clonal complex**

2 haplotypes increased in frequency



- **No temporal structure** (AMOVA – FST)
- **Spatial structure *in progress*** :
  - No IBD for Cycle 1
  - Significant IBD for Cycles 2 and 4
  - No IBD at the microplot level

➔ **Susceptible eggplants E8 impact diversity and genetic structure of bacterial population**

CONCLUSIONS AND PROSPECTS

① Not enough cycles to observe a **resistance breakdown**
  ➔ Increase in frequency of virulent alleles in progress?

① E6 impacts *R. solanacearum*'s infectious potential due to a **pre-infectious mechanism**
  ➔ Role of root exudates? Bactericide? Bacteriostatic?
  ➔ Recruitment of an antagonist microbiome?

② & ③ Successions of susceptible eggplant **E8 influence bacterial population structure**
  ➔ Selection of genotypes highly adapted?

This study gives new insight for a **durable management of plant disease resistance**

HOW?
  ➔ Pyramiding **E6** resistance with other sources of resistance.
  ➔ Using **E6** in cultivar mixture or in rotation with BW suppressive crops.

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